# The "Coptic" textiles of the "Museo Egizio di Torino": a focus on dyes through a multi-technique approach

M. Gulmini ([a]), A. Idone([a]), P. Davit ([a]), M. Moi ([a]), M. Carrillo([a]), C. Ricci([a]), F. Dal Bello([b]), M. Aceto ([c]), M. Borla ([d]), C. Oliva ([e]) & C. Greco ([f])

([a]) Università degli Studi di Torino – Dipartimento di Chimica, Via P. Giuria 5, 10124 Torino, Italy
([b]) Università degli Studi di Torino – Dipartimento di Biotecnologie molecolari e scienze della salute, Via Nizza 52, 10126 Torino, Italy
([c]) Università degli Studi del Piemonte Orientale – Dipartimento di scienze e innovazione tecnologica, Via Michel 11, 15121 Alessandria, Italy
([d]) Soprintendenza Archeologica del Piemonte, Piazza S. Giovanni 2, 10122 Torino, Italy
([e]) Fondazione Museo delle Antichità Egizie, via Accademia delle Scienze 6, 10123 Torino, Italy

The "coptic" collection of the museum encompasses fragments from tunics, household textiles and dressing accessories, most of them without a defined archaeological context (Borla 2013). Dating was obtained by means of stylistic features and highlighted the distribution of the textiles from the Roman to the Islamic period. The scientific examination was performed on about 200 textiles, which show monochrome or polychrome decorations obtained by weaving dyed threads of wool.
As a first step, the textiles were inspected *in situ* by non-invasive spectroscopic techniques (namely reflectance spectroscopy and fluorescence analysis, both employing fibre optics).
Then, 33 samples were taken from selected textiles in order to deepen the picture on the dyeing materials by means of high performance liquid chromatography coupled with photodiode array detection and mass spectrometry (HPLC-PDA-MS).
The non-invasive survey enables the direct identification of some of the dyes (Gulmini et al, 2013). In particular, the spectroscopic features of indigo/woad are evident even when this dye is employed in combination with yellow or red dyes to obtain green and purple shades, respectively. The non-invasive investigation also enables the distinction between red dyes from plants (such as madder) and coccid insects dyes.
As for purple hues, the spectroscopic data highlighted the presence of three different situations: some of the investigated textiles were dyed by combining indigo with madder, others were obtained by coccid dyes and indigo and a very limited set of samples were dyed with shellfish purple.
On the contrary, more detailed information on the family of the insect dyes (cochineal, kermes or lac dye) and on the yellow dyes could not be accessed by the non-invasive approach, therefore a micro invasive analysis by HPLC-DAD-MS was necessary.
By employing this technique, weld was identified as the yellow dye, whereas lac day was identified in samples dyed with insect dyes.
Red and purple dyes offer the most significant information, as they can be possibly related to the age of the textile (Verhecken, 2007). In particular, in the case of the considered textiles, results obtained for some samples would suggest the need of re-considering their dating on the base of the detected materials.

**References**

Borla M., Il progetto di studio e analisi dei coloranti dei tessili "copti" del Museo Antichità Egizie di Torino: notizia preliminare. – In: Quaderni della Soprintendenza Archeologica del Piemonte (QSAP) 28, Torino 2013, pp. 337-341.
Gulmini M., Idone A., Diana E., Gastaldi D., Vaudan D., Aceto M., Identification of dyestuffs in historical textiles. Strong and weak points of a non-invasive approach, Dyes and Pigments, 98 (2013) 136-145
Verhecken A., Relation between age and dyes of 1st millennium AD textiles found in Egypt, in: A. De Moor and C Fluck (eds.) Methods of dating ancient textiles of the 1st millennium AD from Egypt and neighbouring countries, 2007, 206-217